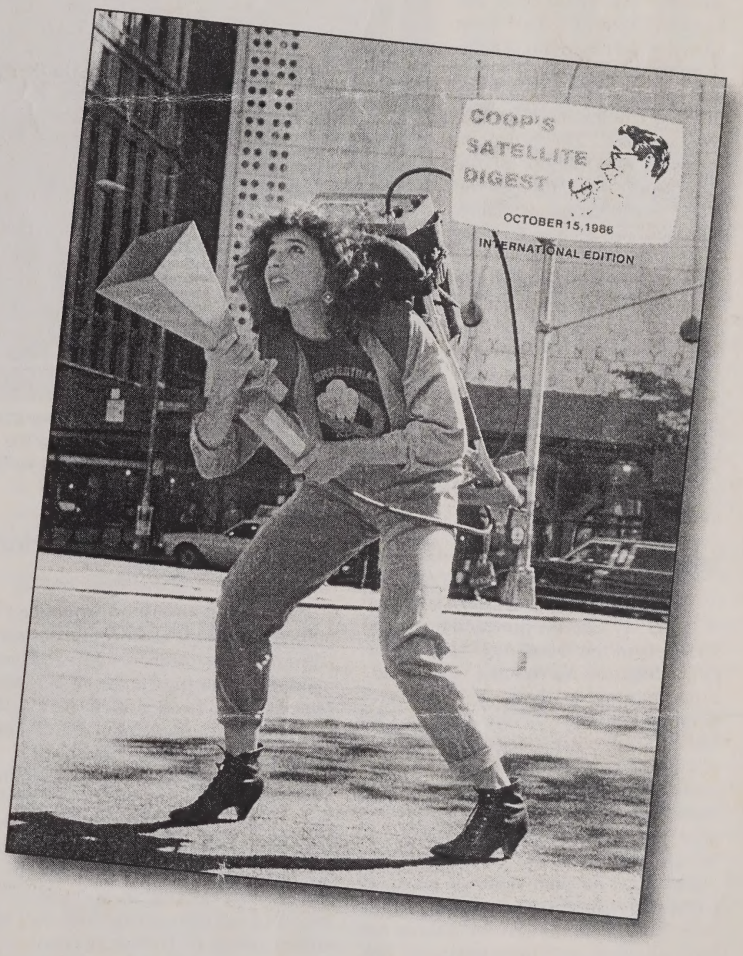
It's a Wonderful World, Bob Cooper

A brief history of home TVRO



By Tim Olin

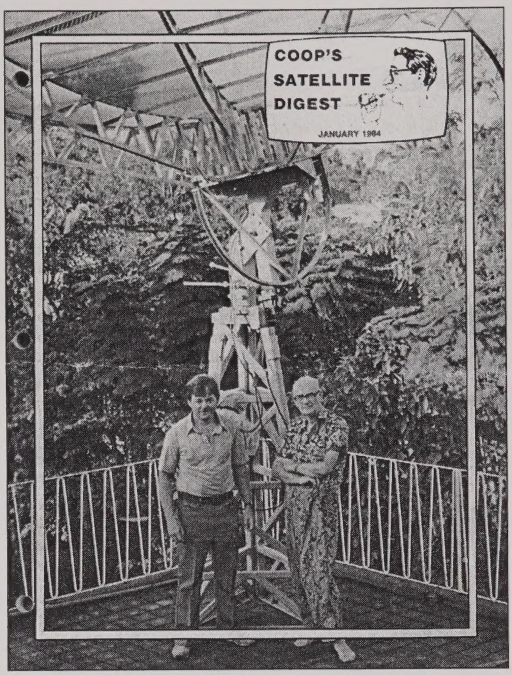
The history of satellite communications will hit fifty years of age in 1995. It's had a varied, colorful and interesting history. Satellite communications has changed the way we think, communicate, entertain and do business. There's no way short of a book to cover all the events and people who brought us to this point.

One major part of this history is the saga of home TVRO reception. It's a saga because it has many of the elements: suspense, big money, colorful characters, grand stories of success and sad chronicles of miscalculations. It's a tale of people with vision. There's a refrain in a Grateful Dead song that goes like this: "What a long, strange trip it's been." That could easily refer to the history of home TVRO. What follows is but an overview of that history.

In 1945, the famous science-fiction writer Arthur C. Clark, proposed a way to overcome the problem of unstable, terrestrial television signals. He envisioned an orbiting satellite a hundred miles above the earth that would allow TV signals to be broadcast in a wide area. However, the satellite would take ninety minutes to orbit the earth thus limiting its usefulness because the signal would fade in and out as the satellite would spin past. He went on to point out that a better idea would be to send the satellite into an orbit 22,300 miles above the earth. That way it would

take 24-hours to make its way around the earth, the same time as it takes the earth to turn on its axis. Then the signal could be received by a fixed antenna.

Twelve years later, Russia stunned the world with the launch of Sputnik 1. That event kicked off an explosion of activity aimed at launching satellites into space. In 1962, the world's first intercontinental TV broadcast occurred. The broadcast consisted of a picture of the American flag waving over the AT&T earth station in Maine, but it was also seen in England and France. Two years later, the 1964 Olympics were held in Tokyo and they came to American TV sets via Syncom II. Canada was the first country to really begin utilizing satellites on a widespread basis. They began using them for phone service and broadcast communications to reach remote areas where earthbound services wouldn't work.



The father of geostationay satellites, Dr. Arthur Clarke (right) is joined by 1983 TVRO Industry Man of the Year David P. Johnson of Paradigm Manufacturing in this January 1984 cover photo.

Westar 1 Launched

The first multi-use satellite was launched in 1974 for Western Union and was called Westar I. In the fall of 1975, Home Box Office began using Westar 1 to distribute programming to their cable affiliates around the country. Before that time they had to send videotapes to each affiliate which was cumbersome, costly and prevented them from offering live events. Cable subscribers in Mississippi and Florida were the first to benefit from this new technology when the George Frazier-Muhammad Ali prize fight was transmitted live from the Philippines. Fifteen thousand HBO cable subscribers in those two states watched the "Thrilla in Manila" live.

HBO took quite a gamble with this strategy. Cable operators who wanted this service had to fork out as much as $125,000 for an earth station capable of receiving the signal. The FCC required the dish (antenna) to be almost 30-feet in diameter to ensure a good picture for cable viewers. The following year they relaxed the requirement and costs fell like the Black Friday stock market, but a typical cable satellite system still cost $15,000 in the summer of 1977.

Experimenters try Their Hand at TVRO Reception

All of this did not go unnoticed by people outside the cable industry. Steven J. Birkill, an Englishman, began to experiment with receiving the signals only cable operators had been getting. Not far behind were two other men, Bob (Coop) Cooper Jr. and H. Taylor Howard.

Taylor Howard, of later Chaparral feedhorn fame and fortune, was a professor of electrical engineering at Stanford University. He took a surplus military dish and mated it with electronic components that he had to build from scratch. The results of this mating bore fruit on a September day in 1976 when he received his first transmission from the orbiting Westar 1 satellite. A display card read, "Attention All Earth stations." It was from HBO, but of course it wasn't meant for him, it was meant for all those cable operators.

Bob Cooper Jr., was then editor of a cable-TV trade magazine and his first successful reception in September of 1977, came from one of the early Canadian satellites. The signal was received on a 20-foot, 3,000-pound "monster" dish. It was a 30-minute newscast originating from Vancouver, British Columbia. Cooper noted that Rod Wheeler, who lived in the Yukon, had a home system up and running a month or so earlier than his.

The pace of satellite-related broadcast activity began to pick up as did the interest in figuring out how to build home systems to receive it. Interest really started to increase as more and more programming began to appear on the satellites. Three of the early program entries were religious broadcasters. CBN (Christian Broadcast Network) began to beam their signal in the summer of 1977. PTL (remember Jim and Tammy Baker) uplinked their programming in the spring of 1978 as did religious broadcaster, Trinity Broadcasting. Other services available in 1978 included: Showtime, WTBN (now TBS) and sports programming from Madison Square Garden.

Coop Exposes all in TV Guide

In October of 1978, Cooper wrote an article for *TV Guide* revealing that he could pick up *The Tonight Show* as NBC was sending it from Burbank, California to New York for taping and adding of commercials. It was sent entirely uncensored, without commercials, in its raw form. And raw it could be at times. NBC soon stopped using satellite to send Johnny Carson's show back to New York, but Cooper received a ton of mail asking him about this new way of watching television. Later that month, Walter Cronkite and the *CBS Evening News* even did a piece on the advantages of home TVRO reception.

Although NBC stopped sending the *Tonight Show* by satellite there was plenty of other raw feed material that offered interesting viewing for home dish owners. *Monday Night Football* showcased announcer Howard Cossell and his colorful remarks made during commercial breaks (when no one, but dish owners were watching). His comments were rather blunt and provocative to say the least. The same could be said for ABC's Max Robinson, a black anchor on the *ABC Evening News.* Max would be seen waiting on camera in Chicago before the program actually went on the air. Dish owners could watch him get

his hair trimmed or listen to his cutting comments made mainly to his white studio assistants. Viewers could also ponder about the glass of tomato juice that was constantly within Robinson's reach. Watching Max had become a minor cult hit with the TVRO crowd and it's said that some bars even offered Max Robinson Bloody Mary specials while patrons peeked in on his news broadcast preparations.

In 1979, Taylor Howard offered a booklet called the *Howard Terminal Manual* which gave many backyard dish wannabes the blueprints to build their own systems. August of 1979 also brought the first public gathering of people who wanted to learn more about this new technology. Bob Cooper conducted the first Satellite Private-Terminal Seminar (SPST) in Oklahoma City, Oklahoma. A group of 505 people showed up, even though Cooper just about didn't. He had to spend a few hours in federal court. At that time, the FCC said it was illegal for anyone to receive private microwave broadcasts without a license. Cooper did happen to have such a license, the day was saved and the seminar did go on. This would not be the last time though that Cooper would have dealings with the U.S. legal system in regard to the home satellite arena.

Two months later, on October 18, 1979, the FCC did away with the license requirement. However, in the eyes of some programmers, the ordinary backyard dish user wasn't supposed to be watching *their* broadcasts. In addition, the Communications Act of 1934 still cast its shadow over the growing homebrew crowd. But that didn't stop those who began to really develop the equipment that would bring down the price of home satellite systems.

Individuals like Robert Coleman, began work on new LNAs or low noise amplifiers (eventually LNAs evolved into LNBs). LNAs were expensive in those early days. One 1977 story stated that RCA ordered two 75-degree Kelvin LNAs for $7,500 apiece. It was difficult to get hold of low temperature LNAs in the early days. The lower the temperature, the more powerful the LNA and the better the reception. Most home TVRO users at that time had 180-degree-and-above LNAs on their systems. The LNA was bi-polar and required two connections, one for the signal and one for power. Today's LNBs use one line and one connection. Dexcel's Art Kawai and Yozo Satoda were at that first Cooper SPST with an LNA for the home market. It didn't do very well, but it plowed ground for Avantek to begin supplying LNAs to the home market. They offered a 120-degree LNA for $795 in lots of 10 back in 1979.

Other Home TVRO Pioneers

Other home TVRO pioneers were Oliver Swan, the man who created the spherical antenna for TVRO and Jim Vines who built the "Paraframe" antenna. He used laminated oak-wood struts mounted to a large ring and aluminum panels to form 12- to 15-foot dishes. Prodelin 10-foot dishes were the first mass produced dish on the market. Soon dish makers appeared from all sorts of places. Hastings Irrigation in Hastings, Nebraska introduced a 12-foot aluminum antenna that came in sections. Price for that dish was $1,395. Huge fiberglass dishes appeared from another irrigation manufacturer in Valley, Nebraska. At one point in time, there were 11 dish manufacturers in Nebraska alone. Randall Odom from Pocahontas, Arkansas was one of the first successful fiberglass dish manufacturers. The first big name company to offer home users not only antennas, but whole systems was Channel Master.

Taylor Howard was working on a feedhorn that didn't cost $200.00 like the commercial versions, and wasn't rectangular. He saw that the feedhorn was the real "antenna" in the TVRO system. It funneled the signals that the dish reflected to a small probe or antenna that is housed inside the feed. The probe then sends the signal to the LNA and from there it travels on to the receiver.

Even though the first satellites had 24-transponders (channels), early on signals were only sent on the horizontal polarization side (12 channels). It was 1978 before anything came up on the vertical polarization. Horizontal and vertical translates into odd and even channel numbers on a system's receiver. Initially, the whole feed system was turned by a television antenna rotor in order to pick up horizontal and vertical signals. Taylor offered a unit with a probe that rotated inside the feed, thus eliminating the cumbersome television rotor. However, his company, Chapparal had to do battle with another feed manufacturer, Boman before it was all over. That in itself is another story.

The cover story on the August 24, 1981 issue of *Newsweek* was *Cable TV, Coming of Age.* It didn't mention anything about home TVRO systems, but it did devote some space to the future of how television could be delivered in the years to come.

> "However the war of the wires turns out, cable will have to contend with a distant, but ominous threat from the same electronic technology that spawned it. Within the decade, it will be possible to beam programs directly from a satellite to the TV set at home. A dozen companies, including CBS, RCA and the Communications Satellite Corp., have applied to the FCC for permission to operate direct-broadcast satellite (DBS) systems."

The article went on to say "DBS does have several disadvantages: it can carry far fewer channels than cable, it lacks the capacity for two-way communications, and

the rooftop dish antennas it requires are considerably more expensive than cable boxes." It took three years beyond *Newsweek's* prediction of 1991 for DBS to finally arrive in mass.

Meanwhile, the inventors, the experimenters and the entrepreneurs continued improving TVRO systems. The February 1982 issue of amateur radio's *CQ* magazine featured two ham radio operators putting the finishing touches on a home satellite dish installation. An article inside told about satellite television while a second article in the magazine covered selection of an appropriate site for a dish. There was enough in that article to whet one's appetite, but it was only the forerunner of information more to come. There would soon be an explosion of magazines devoted to TVRO.

Coop's Satellite Digest: The Bible

The TVRO bible was *Coop's Satellite Digest.* It was a wonderful, informative, insightful publication written in Bob Cooper's straight-ahead style. There was always an exotic touch that permeated the *Digest.* For example, in the February 1983 issue we find this statement.

> "Off on a 12 day 'around the world jaunt' starting off with a private TVRO installation for the President of the Philippines, Behar did something perhaps nobody has every done before. By circling the globe, stopping several times to watch television on 6 meter terminals manufactured by his Florida concern, Behar actually saw and recorded television transmissions from each of the world's operating 4 GHz satellites!"

Behar was Bob Behar of Hero Communications. His company made massive 15-22 foot dishes that were being used round the world.

If you have the January/February 1983 issue of *Satellite TV* magazine you would have seen who was selling equipment to the growing home market. Telecom, Vidare, Amplica, KLM, Gillaspie, Kaul-Tronics, Chaparral, Wilson, Jensen, Dexcel, and Earth Terminals were just a few of the many companies who were jumping into the home dish game. Companies came and went as the industry matured. Fortunes were made and lost within a matter of two years. It seemed as if everyone wanted a piece of the action.

The electronics on a home system continued to improve. Motor drives were added to systems so that a dish could be moved from one satellite to another. Receivers were slowly transformed from unreliable boxes that drifted "off tune" to acceptable, semi-reliable boxes. The downconverter used to be outside on the pole the dish sat on and early receivers had little buttons that you had to push to change the polarity from odd to even transponders. Andy Hatfield, Clyde Washburn, John Ramsey, Sat-Tec, KLM, and Anderson Scientific were a few early electronics pioneers that made TVRO systems work better. However, the topic that clouded an otherwise sunny sky was still the one about the legal aspects of the common man watching those signals from the sky that fell in "his backyard."

The November 5th, 1984 issue of *Forbes* magazine talked about the dish "problem" from the standpoint of a new law that President Reagan was expected to sign shortly — HR4103 the cable deregulation bill. The high points of HR4103 were:

> "manufacture, sale and use of earth stations was officially made legal; dish owners must pay for programming; programming pirates were subject to fines and jail time."

Installations for home systems were estimated at 800,000 for the year 1984 and sales of 1.5 million were predicted for 1985.

About the same time, *Popular Science*'s December 1984 cover story read, "PS buyer's guide: $1,000 to $4,000, 39 satellite antennas you can buy now." The article for the most part was positive, but one interesting paragraph stood out: "These TV signals are free, but is it legal to tune them in? Yes, says the satellite TV industry. Piracy, say major programmers such as HBO. Bills before Congress may soon resolve the question in favor of the consumer." By the end of the year dish owners were no longer pirates-sort of, because on the horizon was SCRAMBLING!

Who would scramble and what would it mean?

The year 1985 in the home satellite TV world was a tense one. Who would scramble? What would it mean? Would it mean the death of home TVRO systems?

The industry continued to experience growth even though installations didn't hit a million. It was a year that saw Magic Johnson in ads for PenTec TVRO systems, mesh dishes became more popular, Pico brought out their odd shaped 4' x 7' antenna, dishes were becoming smaller, Drake and Panasonic were offering systems, Birdview introduced their elliptical "Spoon" antenna and STS gave the TVRO world a strange looking rectangular, honey-combed, mesh antenna. A cover story for *Sight & Sound* magazine was *Satellite TV: Video's Rising Star.* Other elements from "offshore" landed on the scene from Japan (Uniden and DX) and from Sweden (Luxor). The potential for something really big was there, but the scrambling question was still one that needed an answer.

The scrambling issue spawned a mini-industry around trying to break the system that would encode programming signals. Several issues of *Coop's Digest* featured something on scrambling and the monopoly of the M/A-Com LINKABIT strategy. Coop

even began a scramble-fax hotline. M/A-Com, HBO and scrambling were all spoken and came in on the same breath.

When 1986 rolled around the TVRO industry went on the offensive in regard to scrambling. Two personalities stood out in the satellite TV medium. Shaun Kenny's *Boresight* was an open forum used to discuss the problems relating to scrambling. Kenny caused more than one commotion during trade shows with his head-on approach to the evils of the VC2000 decoder.

The other "hot" TVRO show was Keith Lamonica's *FM America*. In the April issue of *Coop's Digest*, Lamonica's followers were described as "bordering on fanatical, not unlike the Iranian death squads dedicated to the Ayatollah." It went on to say, "They have their own bumper sticker: 'What one man can scramble, another man can unscramble.'" The attitude towards scrambling was down right hostile. The September issue of *Coop's Digest* featured a story with the headline, "Oak Orion Broken/ Who's Next?" Every day brought a new rumor about someone that had broke the Videocipher code.

Captain Midnight strikes HBO at midnight!

April 27, 1986 had an event that will be long remembered in the history of satellite TVRO. Captain Midnight struck a little after midnight. The HBO movie, *The Falcon and the Snowman* was interrupted by a message flashed on TV screens around the country that said, "GOODEVENING HBO FROM CAPTAIN MIDNIGHT, $12.95/ MONTH? NO WAY! (SHOWTIME MOVIE CHANNEL BEWARE)."

Needless to say that little act caused quite a stir. It was news that made all the major networks and CNN. Bob Cooper speculated how it was done in the September 1986 issue of *Home Satellite TV*. He felt it wasn't an ordinary "hacker" at all. It had to be someone who was using the "best professional equipment" available. Cooper trotted out a list of other clues that "left a trail as wide as Sherman's advance on Atlanta." It wasn't long before that trail led to John McDoughall. McDoughall was a television engineer who ended up receiving a one-year suspended prison sentence, was fined $5,000 and had his amateur radio license taken away. Thus ended another interesting chapter in the home satellite story.

Illegal chips debut

On the January 15, 1987 cover of *Coop's Digest*, was photograph of a "parade" of Videocipher-busting, descrambling chips basking on the beach. These new chips were called the "Musketeer" chips. It was the beginning of big problems for Bob Cooper, Jr. and *Coop's Digest*. The December 4, 1986 episode of *Boresight* invited parties interested in the illegal chips to attend a gathering at Cooper's home in the Turks & Caicos Islands. The purpose was to teach attendees how VCII decoders worked and as part of the $1,500 attendance fee they would receive four computer chips. These chips would enable a person to receive most scrambled signals once they were installed in a Videocipher II decoder.

Three sessions were held in January of 1987 and the first group returned to U.S. soil unmolested, however, the second group didn't fair as well as they encountered Customs agents with a mission. Customs wanted those illegal chips and got several hundred. The third group, including John "Captain Midnight" McDoughall, now aware of the fate of the second group, returned without any of those nasty chips. Shaun Kenny was part of the second group, but held no chips. Several of his videotapes were detained by Customs agents.

Kenny had been banned from the industry's trade show in Las Vegas because of his overt stand on breaking the scrambling code. He outlined a plan to make some money out of all this on his December 4, 1986 *Boresight* show. For $39, Kenny would remove the U-30 chip of a VideoCipher II module and insert a socket, which would allow the easy insertion of a bootleg chip. On his attorney's advice, Kenny quit the socket install business after his trip to Turks and Caicos.

After the second group's encounter with Customs, Coop decided to hold all conferee's chips, notes and videotapes. Then at a later date he would mail them to the attendees. Customs foiled this plan by telling the group that anything entering the U.S. from the Turks and Caicos would be watched with increased scrutiny. On January 29, 1987, Cooper decided not to ship any of the chips as long as Customs had an interest in this matter. This didn't sit too well with some of the attendees. Cooper decided it wasn't a good idea to set foot back on the shores of America and it's reported that he now resides in New Zealand and is working on a book about the satellite industry.

But the momentum towards "Blackbox" fixes to the scrambling issue couldn't be stopped. Scrambling piracy soon became a big business, much to the chagrin of the legitimate TVRO industry. It was feared that home TVRO business would soon die because of the confusion and apprehension surround piracy. Bad press followed the controversy and dish owners were painted as "freeloaders" and "thieves." More problems followed when M/

A-Com sold the Videocipher technology along with various other assets to General Instruments (GI) for $220,000,000. GI set out to make scrambling secure because if they couldn't programmers would be reluctant to continue to lose money to piracy.

General Instruments intensified the fight against illegal reception of signals. They ran ads picturing a policeman loading a handcuffed man into a car. The ad issued this warning: "Sell an illegally modified satellite descrambler and you'll win a free trip. A trip that could last up to 10 years. And cost you $50,000 or more." Unfortunately all this overshadowed a maturing industry. Respected manufacturers like Drake, Panasonic, Uniden and Toshiba continued to offer product that actually worked first time out of the box. Echosphere, Odom, Chaparral, Winegard and others stayed the course.

The headline on the cover story of the October 1991 *TVRO magazine* stated: "Goodbye Mr. Chips." The industry continued to struggle to gain legitimacy by condemning illegal chippers and board "cloners." General Instruments was working hard to provide a secure signal because they knew if they didn't that (unlikely as it seemed) programmers would seek someone who could. But illegal descramblers numbered in the thousands and GI and the FBI pressed charges against suspected illegal satellite operations in Texas, Louisiana as well as other states. The fight for a secure signal was slow going and GI decided to try another route.

General Instruments agreed to upgrade all legal VideoCipher II decoders in 1992. There were questions about GI's ability to produce enough units and about how much it would cost the consumer. Most of the programmers who were using the VideoCipher II signal agreed to terminate its use in 1992. They would switch to a Renewable Security system in hopes that this tactic would work. As GI began to use their new VideoCipher Plus technology, illegal viewing of programming fell dramatically. However, they still left a loophole. The old Videocipher II signal continued to be sent to cable companies that still had their old decoders. Some employees would copy the "seed keys" from one of those decoders and would sell them to someone outside. This "Wizard Code" would then be punched into a modified descrambler and the customer could receive programming for free.

The next step for GI was the introduction of a 44-digit code that changed almost everyday. An article entitled *Satellite Pirates* in the August 1994 issue of *Wired* magazine describes the next countermeasure pirates used: "The VMS subassembly could be mounted on the old VCII boards and could enable a board to receive its 'wizard codes' automatically from a local dealership, by phone." In 1993 US Customs agents raided the headquarters of the VMS innovators. For the most part the piracy era of TVRO has ended. There will always be someone out there trying to break the code, if for no other reason than just for the challenge of it. A pirate, quoted in the *Wired* article put it this way: "Among the end users, there's maybe 10 percent who are die-hards and won't go legal no matter what."

Now we have DirecTv, Primestar, USSB, digital technology, the 18" dish, and on the horizon, interactive television. Somehow it won't ever be the same. It's big, big business and in some ways just isn't quite as fun as it used to be. But without many of those pioneers it wouldn't have happened at all. In passing, some of you may recognize some names of people, companies, publications and events that were not mentioned above, but were important to that "Long, strange trip." There isn't room enough to name them all, but here are a few:

Hayden McCullough; Bob Luly: Intersat; Jamie Gowen: National Microtech: Satfinder; SPACE; Amplica; Arunta; STS; Norm Gillaspie; LOCOM; David Brough; AVCOM; Ted Turner; The Bell Ranch in New Mexico (home of the first TVRO system at a cost of $22,000); Richard Campbell; Paraclipse; Peter Sutro; Titan Satellite Systems Corp; Cal Amp; Cincinnati Microwave; Automation Techniques; Houston Tracker; Satellite Business; Satellite Today; Satellite Dish Magazine; TV Satellite Videoworld Magazine; Satellite TV Opportunities; Signals from Space; and on and on... ST

Dallas Remote Imaging Group

Satellite Image Consulting

Jeff Wallach Ph.D., President

P.O. Box 117088, Carrollton Texas 75011 - 7088

ON-LINE SINCE 1985

The DRIG BBS is the premier source of information on Satellite Tracking, Satellite Imagery, Telemetry Analysis, Tracking Programs, Satellite Databases, NASA, Space Communications AND MORE!

Over 7 GIGABYTES of files related to Astronomy, Remote Imaging, Amateur Radio, Digital Image/Signal Processing, NASA, AMSAT, and Space!

10 Lines with USR Dual Standard 16.8K Modems

Internet - info@drig.com
Fidonet - 1:124/6509

- Online VISA/MC/AMEX Registration
- Internet/Fidonet via Ku Band Satellite
- Real Time Weather Satellite Images
- NASA/AMSAT Satellite Tracking Elements
- Boardwatch/Connect/USA Today Doors
- Astronomy Databases
- Weather Information Door
- Internet FTP/Telnet in 1994

1 Year Membership - Full Downloading - No Ratios $35.00
1 Year Membership - Full Downloading - Internet $65.00
2 Year Membership - Full Downloading - Internet $95.00

BBS: (214) 394-7438

Voice: (214) 394-7325
Fax: (214) 492-7747